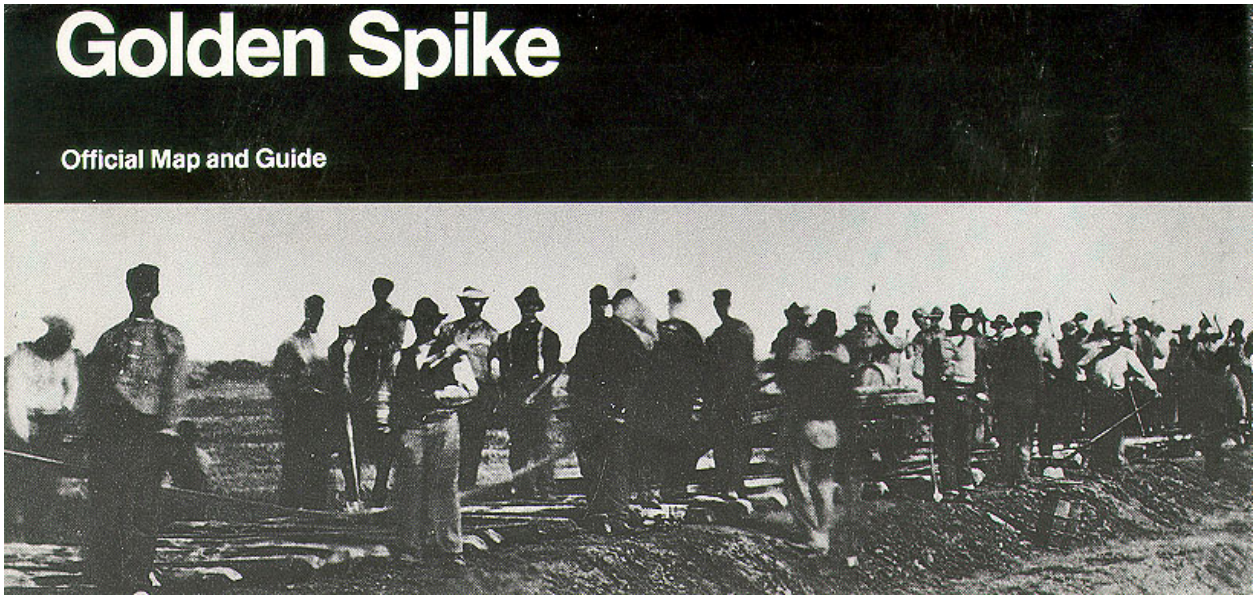

Geologic Resources Inventory Workshop Summary
Golden Spike National Historic Site, Utah
June 14-15, 1999

National Park Service
Geologic Resources Division
and
Natural Resources Information Division

Version: Revised Draft of July 1, 1999

EXECUTIVE SUMMARY

An inventory workshop was held at Golden Spike National Monument on June 14-15, 1999 to view and discuss the park's geologic resources, to address the status of geologic mapping for compiling both paper and digital maps, and to assess resource management issues and needs. Cooperators from the NPS Geologic Resources Division (GRD), Natural Resources Information Division (NRID), Columbia Cascades Support Office (CCSO), Golden Spike NHS (interpretation, resource management and superintendent), US Geological Survey (USGS), and Utah Geological Survey (UGS) were present for the two-day workshop. (***see Appendix A, Golden Spike NHS Geological Resources Inventory Workshop Participants, June 14-15, 1999***)

Day one involved a field trip led by USGS Geologist Dave Miller, who has done extensive geologic mapping and research in the Golden Spike NHS area.

An on-line slide show of the highlights of the field trip can be found at http://www.nature.nps.gov/grd/geology/gri/ut/gosp/field_trip_gosp

Day two involved a scoping session to present overviews of the NPS Inventory and Monitoring (I&M) program, the Geologic Resources Division, and the ongoing Geologic Resources Inventory (GRI). Round table discussions involving geologic issues for Golden Spike NHS included interpretation, paleontological and cave and karst resources, the status of cooperative geologic mapping efforts, sources of available natural resource data, geologic hazards and other management issues, unique geologic features, potential future research topics, and action items generated from this meeting. Brief summaries of each follows.

OVERVIEW OF GEOLOGIC RESOURCES INVENTORY

After introductions by the participants, Joe Gregson (NPS-NRID) presented an overview of the NPS I&M Program, the status of the natural resource inventories, and the geological resources inventory (***see Appendix B, Overview of Geologic Resources Inventory***).

He also presented a demonstration of some of the main features of the **digital geologic map** for the Black Canyon of the Gunnison NM and Curecanti NRA areas in Colorado. This has become the prototype for the NPS digital geologic map model as it ideally reproduces all aspects of a paper map (i.e. it incorporates the map notes, cross sections, legend etc.) with the added benefit of being a GIS component. It is displayed in ESRI ArcView shape files and features a built-in help file system to identify the map units. It can also display scanned JPG or GIF images of the geologic cross sections supplied with the map. The cross section lines (ex. A-A') are subsequently digitized as a shape file and are hyperlinked to the scanned images.

For a recap on this process, go to:
http://www.nature.nps.gov/grd/geology/gri/blca_cure/ ***and view the various files in the directory.***

The geologists at the workshop familiar with GIS methods were quite impressed with this method of displaying geologic maps digitally; Gregson is to be commended for his accomplishments.

Of note regarding the GOSP bibliographic data was that their inventory and ProCite database has not yet been assembled, and that Marilyn Osterman (NPS-Columbia Cascades Support Office) should be consulted by Joe Gregson to have this done.

Bruce Heise (NPS-GRD) followed with an introduction to the Geologic Resources Division. See the GRD website for more information at: http://www2.nature.nps.gov/grd/

INTERPRETATION

The GRI aims to help promote geologic resource interpretation within the parks and GRD has staff and technology to assist in preparation of useful materials including developing site bulletins and resource management proposal (RMP) statements appropriate to promoting geology. Jim Wood (GRD) and Melanie Moreno (USGS-Menlo Park, CA) have worked with several other NPS units in developing web-based geology interpretation themes, and should be considered as a source of assistance should the park desire.

One of the major topics of discussion centered around the development of a publication describing the geology of Golden Spike to be available to visitors, perhaps something as simple as a brochure that could be printed with little cost. Mark Milligan (UGS Extension Services) offered to assist park staff in preparation of such a document, and it is hoped that such a joint NPS-UGS publication can be produced for GOSP. This should be followed up by GOSP, GRD and UGS staff.

PALEONTOLOGICAL AND SPELEOLOGICAL RESOURCES

Paleontological and speleological natural resources were briefly discussed and the following items were pointed out as being noteworthy for Golden Spike

- Fossil corals and crinoids in the Paleozoic Oquirrh Formation
- Ostracodes in White Marl (latest Pleistocene, from Lake Bonneville deposits)
- Pack rat middens at an undisclosed cave location within the NHS

Vince Santucci (NPS-GRD Paleontologist) is assembling an NPS servicewide paleontological database, and should be consulted on any information he may have for GOSP.

STATUS OF GEOLOGIC MAPPING EFFORTS FOR GOLDEN SPIKE NHS

Dave Miller (USGS-Western Region in Menlo Park, CA) has done extensive geologic mapping for the USGS in cooperation with the UGS in the Golden Spike area. He has worked on several quadrangles and has compiled a *1:100,000* scale geologic map that encompasses the following 7.5' quadrangles:

- **Lampo Junction:** M-136; *Geologic Map of the Lampo Junction quadrangle, Box Elder County, Utah* by D.M. Miller, M.D. Crittenden Jr., and T.E. Jordan, 17 p., 2 plates, 1991, $5.00. Publisher: USGS
- **Sunset Pass:** M-154; *Geologic Map of the Sunset Pass quadrangle, Box Elder County, Utah* by D.M. Miller and J.D. Schneyer, 14 p., 2 plates, 1994, $6.00. Publisher: USGS
- **Rozel**
- **Golden Spike Monument**

Lampo Junction and **Sunset Pass** are available from the UGS Bookstore in Salt Lake City and contain paper maps and write-ups on the geology of the quadrangles. Adrienne Anderson thought that the Lampo Junction quadrangle needs more work regarding fills along the railroad (Blue Creek ?).

The **Rozel** and **Golden Spike Monument** quadrangles have fieldwork completed, but need to be compiled for final publication. The **Thatcher Mountain Southwest** quadrangle still needs some fieldwork. Dave estimates that it would take him a few months if he were assigned to work on these maps to deliver finished products.

The UGS will be publishing the 30x60 **Tremonton** quadrangle at *1:100,000* scale, but this scale would be too broad for park use, and thus Miller's existing work at *1:24,000* scale is most desirable and ways need to be sought to obtain his services to complete these three unfinished quadrangles.

GOSP Superintendent Bruce Powell volunteered to write a friendly letter requesting Miller's services from the USGS for this NPS project.

OTHER SOURCES OF NATURAL RESOURCES DATA FOR GOLDEN SPIKE

- NRID has compiled a geologic bibliography for numerous parks and monuments, including Golden Spike. Visit the website at: http://165.83.36.151/biblios/geobib.nsf; user id is "geobib read", password is "anybody".
- Adrienne Anderson (NPS-Intermountain Region; cultural resources) presented maps of the cultural areas within GOSP. She also drew attention to the layouts that Dave Hammond has prepared
- The *100,000* scale compilation that Dave Miller has put together based upon the 5 quadrangles previously mentioned
- Dave Miller has supplied some additional bibliographic sources to add to the master bibliography for GOSP based on material taken from his published Sunset Pass and Lampo Junction quadrangles; these need to be added to the IM database
- consult with Larry Martin about the NPS-WRD “Drinking Water Source Protection Plan” 4-99;

DISTURBED LANDS

The following were classified as disturbed lands:

- Borrow pits for gravel
- Sites to restore: some grazing impacts; good example of issue building adjacent to NPS areas
- Private land gravel pit that is an eyesore
- Union Pacific grade where it’s been eroded away; minimize erosion for now
- Wash Culvert dated 7-14-1916; Area where we talked about Dave Steensen (NPS-GRD Disturbed Lands coordinator) assisting GOSP staff
- Gravel operation on Adams Ranch that is an eyesore

GEOLOGIC HAZARDS AND OTHER RESOURCE ISSUES

There are numerous issues related to geologic hazards in and around Golden Spike NHS. Below is a brief list supplied by Dave Miller from his Sunset Pass quadrangle summary report; should you desire more information, please consult this publication directly:

- **Floods**. Floods have potential for creating hazards in much of the Sunset Pass quadrangle. A potential exists for debris flows and floods on alluvial fans. Several Holocene alluvial fans mapped along both sides of the North Promontory Mountains have been active since the deposition of Bonneville lacustrine deposits; all are probable sites for future alluviation, including deposition during floods. Narrow canyons upslope from the fans are also likely sites for powerful floods and debris flows.
- **Gullying**. Gullying has occurred in many areas underlain by unconsolidated to moderately consolidated materials; the uplands undergoing intensive agriculture east of the North Promontory Mountains show especially pronounced gullying. The fine-grained Miocene, Pliocene, and Quaternary materials in the Sunset Pass quadrangle are highly susceptible to the erosion that results from destroying natural ground cover.
- **Earthquakes**. Northern Utah is part of a seismic belt characterized by numerous small-magnitude events and by potential for infrequent major events. The region from Hansel Valley east to the Wasatch Mountains has experienced considerable historic seismic activity, including magnitude 6 and larger events in Hansel Valley in 1909 and 1934.

  No fault scarps or faults cutting upper Pleistocene deposits were discovered during field investigations. The youngest faults cut the oldest alluvial fan deposits of Pliocene and Pleistocene age, but not upper Pleistocene materials, and therefore probably are no younger than middle Pleistocene in age. However, several Quaternary and historic surface ruptures have been documented within a short distance of the Sunset Pass area, and Holocene alluvium or talus may have covered similar young scarps in the quadrangle. During 1934, a magnitude 6.6 event occurred in Hansel Valley , and surface rupture from this event is documented about 8 km (5 miles) west of the Sunset Pass quadrangle. The western flank of the North Promontory Mountains has a particularly abrupt topographic expression, and Jordan (1985) and Robison and McCalpin (1987) mapped normal faults cutting Pleistocene alluvial fan deposits in one area and Lake Bonneville deposits in another north of the Sunset Pass quadrangle along the mountain front.

  The regional history of seismic activity and evidence for Quaternary faults in Hansel Valley raises the possibility of moderate to large earthquakes in the Sunset Pass quadrangle. The Wasatch fault zone and related faults 50-km (30 miles) to the east project westward at moderate angles, presenting a potential for a major seismic event that could strongly shake the Sunset Pass area. In addition to hazards from ground shaking and surface rupture, lateral spreads and liquefaction could result from an earthquake.
- **Landslides**. Landslides are present as a few isolated slides within lacustrine deposits and Miocene strata. The slumps within lacustrine materials in the east-central part of the quadrangle involve thick lacustrine gravel deposits that probably

were built northward by shoreline processes, overlapping finer grained sediments. These features create steep, unstable slopes along which slides still are likely to occur.

- Also mentioned during the meeting was the possibility for **volcanism**.

UNIQUE GEOLOGIC FEATURES

The Golden Spike area has some unique geologic features; a few are listed below:

- Chinaman's arch
- Flood deposits behind railroad embankments
- Hansel Valley ash layer
- Pliocene upland valley blankets
- Lake level strand lines from the Provo, Bonneville, and Stansbury shorelines (the Gilbert shoreline, however is not exposed)
- views of the Great Salt Lake
- There is also a cave in the park; but it's location is not disclosed to the public or noted on park maps
- pack rat middens

POTENTIAL RESEARCH TOPICS FOR GOLDEN SPIKE NHS

A list of potential research topics and future needs includes the following:

- Pack rat midden studies for recent climate history for pollen record
- GOSP is an excellent candidate for studies of the interaction between climate change, land-use history, and landscape processes such as erosion and deposition. The ~150 year photographic and written and oral record can be deciphered along with sedimentation and erosion histories recorded along major streams such as Blue Creek.
- Study deposition behind culverts and filled grades for their historic flood history, which can be compared with the historic record of climate. This will lead to a better understanding of erosion and stability of fragile culverts and trestles.

ACTION ITEMS

Many follow-up items were discussed during the course of the scoping session and are reiterated by category for quick reference.

Interpretation

- Attempt to create a geology brochure specific to GOSP with the assistance of UGS Extension Services, NPS-GRD, NPS Cultural Resources, and GOSP staff

Paleontological and Speleological Resources

- Develop an in-house plan to inventory, monitor and protect significant resources from threats; assign staff to oversee

- Vince Santucci should be contacted about the GOSP paleo collection for his database

Geologic Mapping

- Maintain USGS-NPS-UGS cooperation to reap all possible products from existing work to benefit the NPS GRI

- Have Bruce Powell (GOSP Superintendent) write a letter to the appropriate parties at the USGS requesting the services of USGS geologist Dave Miller to assist in completing the missing pieces of the GOSP quadrangles to facilitate for use as a park management tool

Natural Resource Data Sources

- Attempt to obtain permission to reprint or web-post various publications on GOSP from various publishers
- NRID-IM (Joe Gregson) needs to contact Marilyn Osterman about completing the bibliographic inventory for GOSP
- Add Dave Miller's bibliographic references to the GOSP database on the GeoBib website hosted by NPS-IM

Miscellaneous

- Dave Steensen (NPS-GRD Disturbed Lands coordinator) should be consulted for his expertise and opinions on the Wash Culvert Restoration

APPENDIX A
Golden Spike NHS Geological Resources Inventory Workshop Participants
June 14-15, 1999

NAME	*AFFILIATION*	*PHONE*	*E-MAIL*	Field Trip	Scoping Session
Bruce Heise	NPS, Geologic Resources Division	(303) 969-2017	Bruce_Heise@nps.gov	x	x
Joe Gregson	NPS, Natural Resources Information Division	(970) 225-3559	Joe_Gregson@nps.gov	x	x
Tim Connors	NPS, Geologic Resources Division	(303) 969-2093	Tim_Connors@nps.gov	x	x
Marsha Davis	NPS, Columbia Cascades Support Office	(206) 220-4262	Marsha_Davis@nps.gov	X	x
Dave Miller	USGS	(650) 329-4923	Dmiller@usgs.gov	X	X
Mark Milligan	UGS	(801) 537-3326	Nrugs.mmilliga@ut.state.us	X	X
Grant Willis	UGS	(801) 537-3355	Nrugs.gwillis@state.ut.us	x	
Bruce Powell	NPS, GOSP	(435) 471-2209 ext. 12	Bruce_M._Powell@nps.gov	X	X
Rick Wilson	NPS, GOSP	(435) 471-2209 ext. 19	Rick_Wilson@nps.gov	X	X
Adrienne Anderson	IMDE-CNR, Archaeologist	(303) 969-2846	Adrienne_Anderson@nps.gov		X

APPENDIX B
Overview of Geologic Resources Inventory

The NPS Geologic Inventory is a collaborative effort of the NPS Geologic Resources Division (GRD) and Inventory and Monitoring Program (I&M) with assistance from the U.S. Geological Survey (USGS), American Association of State Geologists (AASG), and numerous individual volunteers and cooperators at NPS units, colleges, and universities.

From the perspective of the servicewide I&M Program, the primary focus (Level 1) of the geological inventory is

1. to assemble a bibliography of associated geological resources for NPS units with significant natural resources,

2. to compile and evaluate a list of existing geologic maps for each unit,

3. to develop digital geologic map products, and

4. to complete a geological report that synthesizes much of the existing geologic knowledge about each park. The emphasis of the inventory is not to routinely initiate new geologic mapping projects, but to aggregate existing information and identify where serious geologic data needs and issues exist in the National Park System.

The NPS Geologic Resources Division is an active participant in the I&M Program and has provided guidance and funding in the development of inventory goals and activities. GRD administers the Abandoned Mine Lands (AML) and Geologists In Parks (GIP) programs which contribute to the inventory. NPS paleontologists, geologists, and other natural resource professionals also contribute to inventory planning and data. A major goal of the collaborative effort is to provide a broad baseline of geologic data and scientific support to assist park managers with earth resource issues that may arise.

For each NPS unit, a cooperative group of geologists and NPS personnel (the Park Team) will be assembled to advise and assist with the inventory. Park Teams will meet at the each NPS unit to discuss and scope the geologic resources and inventory, which is the subject of this report. If needed, a second meeting will be held at a central office to evaluate available geologic maps for digital production. After the two meetings, digital geologic map products and a geologic report will be produced. The report will summarize the geologic inventory activities and basic geology topics for each park unit. Due to the variety of geologic settings throughout the NPS, each report will vary in subject matter covered, and section topics will be adapted as needed to describe the geologic resources of each unit. Whenever possible the scientific sections of the report will be written by knowledgeable cooperators and peer reviewed for accuracy and validity.

APPENDIX C
Golden Spike NHS
Index of Quadrangle Maps
(*1:62,500 scale and larger*)